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## THE WORTH OF FRESH AIR.



YOUR neighbour, John Stedman, is set fast with aches and pains, and is very ill. You have just been to see him, you say, and you cannot think why it is that people are every now and then attacked in this way with sickness. You have been told that God sends disease; but for your own part you cannot understand then why it is that some of your neighbours, who, like John Stedman, seem to be the most honest and deserving, get the largest share of it. I think, my industrious friend, I can perhaps help you to the explanation of the riddle. At any rate there are many things, touching upon this very subject, which as an old acquaintance, and one who has learned through long intimacy to take great interest in all that concerns you, I have for some time desired to say. I shall now seize this opportunity to make a beginning, and shall sit myself down comfortably that I may chat with you more at my ease. Pray do not trouble yourself to move any thing. This empty chair near the door will do excellently well for me. I know you will listen to me with attention and patience, first for old friend-

ship's sake, and then because you will very soon feel that what I do say is intended frankly and solely for your good.

You have a fine, smart-looking clock, I see, ticking away there opposite. But the old fellow can hardly be so correct as he seems; his hands point to eight, although the day wants but a couple of hours of noon. I fear there must be something wrong about him, notwithstanding his looking so vastly well in the face.

You say you cannot make the clock keep time. You wind it up carefully every Saturday, and set it correctly, and yet before the next Saturday comes round, it has either lagged hours behind, or it has galloped on hours too fast. It goes as if it were moved by the uncertain wind, instead of being driven by regular machinery, and it was a shame for the man to sell you such a bad-going thing. If the clock never did behave itself better, you are right in this: but perhaps you are too hasty in finding fault with the maker; he may not altogether deserve the blame. Let us just open the door of the case, and peep at the inner workmanship, to see whether we cannot discover some cause for the irregular performance.

What is this? As soon as I open this little door I stumble upon something that looks rather suspicious; it is a quantity of light flue, and hair, and dust, mingled together. The clock-maker never put that into the case. Then, observe how every wheel and pinion is soiled with dirt, and every crevice and corner is

choked up with filth. It really would be a very wonderful thing if the wheels did move regularly. The secret of the bad working of your clock is, simply, that you have not known how to take care of it, and use it fairly. I dare say it went very well when it was turned out of its maker's hands, but he never meant it to be in the state in which it now is. You must send it back to him, and get him to clean the works and oil the wheels, and then you must try whether you cannot prevent it from getting into such sad disorder again.

Now, your neighbour yonder with his aches and pains and his sickness, are you sure that he is not in very much the same predicament as this clock? If we could look into the works of his body, are you confident that we should not find them choked up and uncared for, instead of being in the condition in which they were intended to be? His aches and pains, are they not the grating and complaining of deranged and clogged machinery? I am quite aware that sick people generally are not sensible of having allowed anything to come near to their bodies which they ought to have kept away. But neither did you know that dirt was getting to the works of your clock, although we discovered it there in such plenty. The dust and dirt which collected there, first flew about in the air, scattered so thinly and lightly that you could not see them. So, too, other things which you cannot see may have been floating in great abundance

round you, some of them being to the living frame what dirt and dust are to clock-work. That there are such invisible things floating around living creatures, and that some of these clog and derange the working of their frames, I think I shall have no difficulty in showing you. I hope I shall also be able to point out to you, that many of them may be discovered, although they cannot be seen, and may be driven away or avoided.

That wonderful object which you call your *body*, is actually a machine like the clock, contrived and put together for a certain service. It has for its works, muscles and bones, and blood-vessels and nerves. These works have been most beautifully fitted and adjusted: indeed they are the workmanship of a skill which cannot fail. The maker of your body is the great and unerring Power, who has also made all the rest of creation. It is GOD.

God made your body with supple joints and free limbs; with strong muscles and ready nerves. The machine was perfect when it came from His hands. It was then capable of going better than the best clock that was ever constructed by human ingenuity. It was able even to cleanse, and oil, and repair itself, and it was prepared to continue its orderly movements, without suffering the slightest derangement, for sixty or seventy long years. But when God placed this perfected piece of delicate workmanship at your disposal, He, like the clockmaker with his clock,

required that you should at least take care of it, and use it fairly. If, however, you do not do this, then as with the clock, so will it be with your body. If you keep it amid dust and dirt, no other result can come but the clogging of its works, and the derangement of their movements. Out of that dusty old clock-case it is my purpose to draw this very surprising and important lesson in your behoof. WHENEVER MEN GET OUT OF HAPPINESS AND EASE INTO WRETCHEDNESS AND DISEASE, IT IS ALMOST SURE TO BE THEIR OWN FAULT, AND THE CONSEQUENCE OF THEIR OWN DOINGS. Either they perversely and wilfully do something which they know very well they ought not to do, or they do something which they ought not to do, in ignorance, not knowing that it is wrong.

Comfort and ease are to body and mind, what steady and even movements are to clock-work—signs that the machinery is in perfect order. Discomfort and *dis-ease* (*absence of ease*) are to body and mind what fitful and irregular movements are to clock-work; —signs that the machinery is clogged and in disorder. You are always inclined to rebel against discomfort and pain. Never give way to this inclination. Discomfort and pain are friendly monitors, that come to you to perform a kind service. They come to warn you that there is something wrong in and around your own body, which requires to be set right.

You will observe that I have said men *nearly* always have themselves to blame when they get out of health



and into disease. I have said nearly always, because it occasionally does happen that the suffering is not immediately caused by the sufferer's own wrong doing. This, for instance, is the case when a child has a constitutional disease, which has been communicated to it by a parent. It is, however, even in these instances none the less true, that *human blindness or wilfulness* leads to the mischief, and this is really the practical point that I am desirous you should see. These are the cases in which, in accordance with God's law, "the sins of the fathers are visited upon the children." The parents have done wrong, and the offspring have to pay the penalty. The line of obvious duty, however, is in no way altered here. If a man suffers because his parents did what was wrong, this really is an additional reason why he ought never to do that which may cause his own children to suffer, in like manner, with himself.

There is this further proof, that even in these cases it really is *man's wrong doing which leads to human suffering*. When the children of parents who have done what was wrong, go on doing only what is right through several generations, their offspring at last cease to suffer, and become altogether healthy and sound. The burthen of the fathers' sins is then, at length, mercifully taken off from their shoulders.

Having listened patiently to this little sermon, you would now like me to come to the point, and show you some of the dust and dirt which are scattered



around the living body, and which at times get into the machinery to the damage of its working. First of all, in my endeavour to do this, I should like to make you quite comprehend the possibility of there being very weighty matters pressing close round you, which you nevertheless are entirely unable to see, even in bright daylight. Just come out with me, here, upon the road. How pleasant and fresh the day is. Do you not feel the gentle breeze fanning your cheek as you turn up the lane? Yet you cannot see the breeze! What is it, then? Certainly it is *something*, for it touches and even presses against your skin. But it is something, too, which has weight and power of its own. Observe how it shakes the leaves of the trees as it sweeps past them. It is, as you know, the same unseen breeze which also drives round those great mill-sails yonder with such violence, and which grinds as much corn in that mill, as could be ground by the efforts of a dozen horses, kept up to their work by the whip. We have not had to move far, then, before we have come upon something which we cannot see;—before we have proved to ourselves that we must not altogether depend upon our eye-sight for information, even concerning the existence of surrounding things.

But what is this? The breeze is not so fresh here as it was just now at the end of the lane. There is some very disagreeable smell now floating upon it. Here again we can see nothing, any more than we

could when we had only the fresh breeze blowing around us. But there must be some cause for the unpleasant odour. The smell gets stronger and stronger as we approach this bank. We climb over the bank, and we find on the other side, in the corner of a field, a manure-heap, from which the smell is evidently poured out. NOW THAT SMELL IS REALLY A VAPOUR, BRED OF DECAY IN THE MANURE, AND THEN STEAMING UP FROM IT INTO THE AIR. If our eyes were as sharp as our noses, we should be able to see a great host of little bodies rushing up from the manure, and scattering themselves through the air. It is because some of those little bodies strike upon the lining of our noses, as they are drawn in by our breathing, that we smell the unpleasant odour. The nose feels the touch of those bodies as a smell.

Wherever substances which have been alive, are dead and undergoing decay, vapours of this kind are bred and steamed forth. This is the way in which dead things are got rid of; they turn to vapour and crumble to dust. If we could see all the vapours that are being bred of decay, we should be sensible of a thick mist covering the entire face of the land and sea, and rising up from it continually. Some of these vapours have strong smells, like those which issue from the manure-heap; but some of them cannot even be smelt, any more than they can be seen.

But these invisible vapours bred of decay, were not intended to be breathed by living creatures; and,

indeed, cannot be breathed by them without mischief. We are able to stand near the manure-heap for some time without taking any particular harm, because the vapours are scattered as fast as they are formed, and are mingled in small quantities with large quantities of pure air. We thus breathe air tainted with these vapours, rather than the vapours themselves. But suppose all the air were taken away, and you were left standing with nothing around you but these vapours, what do you think would happen to you? You would be dead in less than three minutes, killed by their poisonous power. THE VAPOURS WHICH ARE BRED IN DECAYING SUBSTANCES ARE POISON-VAPOURS.

You would like to know why it is, as these poison-vapours are poured out in such quantities from all decaying substances, that you do not see people dying all round from breathing them. Did I not tell you, in the case of the poison-vapours of the manure-heap, that you could breathe them because they were freely scattered into the fresh air? Now just come a few yards this way. You observe the smell of the manure grows less and less. Here you cannot any longer perceive it, although the wind is actually blowing over the manure-heap towards us. The fact is, THESE POISON-VAPOURS CANNOT BEAR THE PRESENCE OF PURE AIR. Pure air is the natural *antidote* or remedy for their poison. The instant it mingles with them it begins to destroy their hurtfulness, and in a few moments it has so thoroughly

accomplished this good work that no single trace of mischievous power remains.

Has it ever occurred to you to ask yourself why the pleasant wind blows over hills and fields, and through lanes and streets? You know very well that the wind always is blowing, more or less. Go out when you will, you find it, if you turn the right way. It is the most uncommon thing in the world for the air to be altogether still. The fresh wind blows so constantly over hill and plain, because God sends it to sweep away and destroy the poison-vapours that steam out from decaying substances. The breeze is God's invisible antidote to the invisible poison. THE PLEASANT WIND BLOWS IN ORDER THAT THE AIR MAY BE KEPT FRESH AND PURE.

In the open air the fresh wind very soon scatters and destroys all poison-vapours. But civilized men do not dwell always in the open air. The wind sometimes makes them feel cold, so they build themselves houses to shut out the wind. To-night, before you go to bed in your small sleeping room, you will close the windows and the door; and you will think, when you have done so, that you have shut out everything which could harm you, with the cold. But what will you say to me if I show you that after you have closed the windows and the door, POISON-VAPOURS ARE BRED IN GREAT QUANTITIES IN THE ROOM WHERE YOU ARE LYING? and that so long as you remain in it, they keep gathering more and more strength, and

becoming more and more dangerous. Just come back with me to the cottage, and let us look at the room in which you were sleeping last night. The beds, you believe, are not yet made—never mind that. I often go into rooms under such circumstances, and perhaps upon this occasion it may be even better for the purpose I have in view, if I find the chamber in disorder. At any rate let us go upstairs and take our chance.

Sure enough you have been at great pains here to keep the cold from getting in. There is only one casement in this low small room, and that casement has not been unbarred since yesterday. I do not need to be told this. I make the discovery myself; for you have also kept something from getting out, which had better have been away. I feel at once this is not the same kind of air which we were breathing just now in the open garden. Indeed, I cannot remain in the room without opening the window. There; I throw open the casement, and in a few minutes the air will be as fresh here as it is outside of the house.

Now what do you think it was that made the air of this room so unpleasant? It was the poison-vapour with which it was laden, and which had steamed out of your body mixed with your breath during the night. POISON-VAPOURS ARE BRED IN THE BODIES AND IN THE BLOOD OF ALL LIVING ANIMALS, just as they are in manure-heaps. All the working organs of your frame being exhausted by use, undergo decay and are turned into vapour, and that vapour, being

*bred* of decay, is *poison-vapour*, which must be got rid of out of the body as quickly as it is formed. Living bodies are worn away into vapour by working just as mill-stones are worn away into dust by grinding. You would see them waste under work, if it were not that they are repaired by food. You wonder, then, that as this vapour is poisonous, living creatures do not destroy themselves by the poison they form in their blood? Occasionally human creatures do so destroy themselves, as I shall presently show you. But the merciful Designer of the animal frame has furnished a means by which, in a general way, the poison is removed as fast as it is formed. Can you not guess what this means is?

God employs the same plan for driving away poison-vapours from the inside of living animal bodies, that He uses for the purification of the air in the open country. He causes a current of air to circulate through them. Notice how, while we are talking together, our chests heave up and down. You know this is what we term breathing. Now, when we breathe, we first make the insides of our chests larger by drawing their walls and floors further asunder. Then we make them smaller by drawing their walls and floors once more nearer together. When the chest is made larger, fresh air rushes in through the mouth and wind-pipe, and through the twig-like branches of this pipe, until it fills a quantity of little



round chambers which form the ends of those branches. Look at this picture. It is a representation of one of these chambers, greatly magnified, in order that its character may be readily seen. The wind-pipe branches out into several millions of fine twig-like tubes, and then each tube ends in a blind extremity, or chamber exactly like this.



Do you observe that the air-chamber in the picture is covered by a sort of net-work, stretched tightly over it? That net-work is formed of blood-vessels, through which the blood is constantly streaming, driven on by the action of the heart. This blood sucks air from the air-chambers into itself, and carries that air onwards to all parts of the living frame. But the blood-streams in the net-work of vessels also steam out into the air-chambers poison-vapours, which are then driven out through the windpipe and the mouth. Thus the breath which goes into the mouth is *fresh* air; but the breath which comes out of the mouth is *foul* air. Air is spoiled, and, as it were, converted to poison, by being breathed; but the body is purified by the breathing, because it is its poison-vapours that are carried away, mingled with the spoiled air.

This, then, is why men breathe. BREATHING IS THE BLOWING OF A FRESH WIND THROUGH THE LIVING BODY FOR THE CLEANSING AWAY OF ITS IMPURITIES. The purifying part of the air which is breathed actually circulates with the blood through all parts of the frame.



EXERCISE QUICKENS AND EXALTS THE CLEANSING POWERS OF THE BREATHING—and this is why it is of such great importance to the health. When you go and take a brisk walk in the open air, you increase the force of the internal breeze. The exertion makes your chest expand to a larger size, so that it can admit more fresh air, and it also causes your blood-streams to course along more rapidly, so that a greater abundance of the air is carried on through your frame.

A very large quantity of fresh air is spoiled and rendered foul by the act of breathing. You, yourself, spoil not less than a gallon every minute. IN EIGHT HOURS' BREATHING A FULL-GROWN MAN SPOILS AS MUCH FRESH AIR AS SEVENTEEN THREE-BUSHEL SACKS COULD HOLD! If you were shut up in a room seven feet broad, seven feet long, and seven feet high, the door and windows fitting so tightly that no air could pass through, you would die, poisoned by your own breath in a very few hours; in twenty-four hours you would have spoiled all the air contained in the room, and have converted it into poison, provided you could have lived therein so long.

One hundred years ago the English were allowed by the Great Mogul or Emperor of India, to build warehouses and dwellings in certain parts of his Empire. One of these mercantile settlements or factories, as they were called, was planted on the bank of a large river just where Calcutta, the capital city of Bengal, now stands.

In the year 1756, the Nabob, or tributary king of the province of Bengal died, and was succeeded by a very young man, who bore the outlandish looking title of Surajah Dowlah. This young barbarian cast a covetous eye on the neighbouring British factory, and one summer day, attacked the place suddenly with a large army. The small party of English who were in the factory, despairing of their ability to effect any successful defence, tried to make their escape to some ships which were lying in the river.

Several of the fugitives reached the vessels in safety. But in the confusion of the flight, 146 individuals fell into the hands of the victorious Nabob. These, his officers thrust for the night into a small cell, which was used as the prison of the fortress, and was known under the dismal name of the Black Hole of Calcutta. This cell had but two small square holes for windows, and was only 18 feet long and 14 feet wide, so that the last person of the 146 had to be crushed in upon the rest with violence, as the door was closed and locked. The anguish of the crowded captives soon became so great, in this vile hole, that the neighbourhood resounded with the noise of their struggles and cries. As the night wore on, these sounds, however, gradually sunk into silence. When the morning came, and the door of the prison was opened, the reason of this silence became sadly apparent. In the place of the 146 prisoners who were shut up on the previous day, they took out 123 corpses, and 23 mise-

rable beings, who looked more like ghastly spectres than men, and who could hardly be said to be alive. This occurrence furnished one remarkable instance of the deadly power of the poison-vapours which are poured out from the inside of living beings. Now I will tell you about another case of a similar kind.

A few years ago, a vessel started from Cork in Ireland, to take a large number of emigrants to a ship just about to sail from Liverpool. A violent storm sprung up in the night, as the vessel was crossing the Irish Channel, and the captain, fearing that the alarmed passengers would interfere with the sailors, and render it difficult to work the ship, sent them all below into the hold, and covered them closely down with the hatches. The imprisoned passengers soon found that they were suffocating, and called and knocked loudly for help, but their cries either were unheard or disregarded. In the morning the hatches were removed, and to the horror of the captain and his crew, the hold was found half full of dead bodies and dying people, instead of containing living men and women. Such are the fearful consequences which follow, when human beings are forced to breathe the same air over and over again.

You are very much shocked, both at the savage cruelty of the Indian tyrant, and at the carelessness and ignorance of the Irish captain. But what will you think of yourself if I now show that you do, in a small degree, every night, what they did on so

large a scale? What was it that caused the closeness of this room before we opened the window? It was the presence of precisely the same kind of poison, as that which killed the prisoners at Calcutta, and the passengers in the hold of the ship. That poison did not destroy you in a single night, only because it had not gathered in sufficient strength to do so. Your room was not more than half as large as the Black Hole of Calcutta, but there were only two of you shut up in it instead of 146. The air of your room was merely hurtful instead of being deadly. But the fact still remains. WHEN YOU ROSE IN THE MORNING, THAT AIR WAS NOT FIT FOR A HUMAN CREATURE TO BREATHE.

When you rise to-morrow morning, just go out of doors for five minutes, and observe carefully the freshness of the air. That air is in the state in which God keeps it for breathing. Then come back suddenly into your close room, and your own senses will at once make you feel how very far the air of your chamber is from being in the same wholesome and serviceable condition.

This is one way, then, in which people produce derangement in their bodies, and cause their works, or organs, to get choked up and clogged. They are not careful always to keep fresh air immediately around them. They suffocate themselves slowly; taking, perhaps, a long time to complete their task, but, nevertheless, accomplishing it none the less.

surely. Individuals who dwell in crowded towns, and, therefore, have to live by day as well as by night in close impure apartments, go down to their graves, even before they have reached their prime; and their thin pale faces, dull sunk eyes, and languid movements, tell they are doing so, with painful clearness. It is well known that people who dwell in towns and work in close rooms, as a rule, die seventeen years earlier than men who dwell in the country, and work in the fields by day.

Country folks escape this *severe penalty*, because even when they half smother themselves by night, the thoroughly fresh air in which they spend the day goes a great way towards the correction of the mischief. Still they are by no means free from *all penalty*. You yourself have suffered from breathing bad air. Do you remember last autumn, when I came to see you sick in bed with the fever? Do you recollect how your limbs ached, and your skin burned then, and how you tossed restlessly from side to side, without being able to sleep, your mouth and tongue being brown and parched with a dryness which water could not moisten? You could not raise your head from the pillow; and once when I asked you how you felt, you answered me by telling me something about the corn stacks and the last harvest, being quite unconscious of what you were saying. What do you think was the matter with you then? Your body and blood were full of poison-vapour. And what do

you think had made them so? Why fresh air had not done its work of purification as it ought. You had been breathing a great deal of impure air, and were paying the penalty for having done so. If you could have seen the prisoners in the Black Hole of Calcutta an hour or two before they died, you would have found them exactly in the same state.

The term "fever" is taken from a Latin word which signifies "to burn." THE SKIN AND THE BODY FEEL BURNING HOT IN FEVER, BECAUSE IMPURE POISONOUS BLOOD IS FLOWING EVERYWHERE THROUGH THEIR VESSELS, in the place of pure blood, and the blood is poisonous because it has not been freed from its poison-vapours as fast as they have been bred in, or communicated to, its streams. In the worst forms of fever the blood gets so impure that it steams out, through the breath, vapours which are able to produce the same kind of disease in other people, and which are, under these circumstances, termed INFECTION. The infectious poison-vapours of fever get so strong when they are received into close rooms, and are not allowed to be blown away, that they often kill persons who breathe them in that state, very quickly.

But you now want me to explain how all the mischief, which results from breathing foul air, may be prevented. Come down with me into the garden, and creatures that you believe to be of far inferior powers to yourself shall give you a lesson.

You keep bees. Here is a hive, I see, crowded with



the busy insects. By the numbers that I observe clustering about the low arched door, and bustling out and in so incessantly, I learn that the industrious little fellows must be very closely packed together in their straw house. There must be many thousands of them dwelling together in a space that cannot, at the most, equal more than a couple of square feet; and there is not a single window in the straw wall; no opening of any kind but the low, and half-choked entrance. Really if those bees need to breathe, you who have furnished them with their dwelling must be nearly as bad as the cruel Nabob, who shut up his prisoners in the Indian Black Hole!

Those bees certainly do need to breathe every bit as much as men and women; and what is more, they manage to breathe ten times better than you do at night. Notwithstanding all the crowding there is within their close dwelling, the air never gets there into the poisonous state in which the air of your sleeping room is by the morning. The bees take care that it shall not do so. Just bend down your ear and listen near the hive for a minute. Do you hear that incessant low humming? That is the bees hard at work, making an artificial wind. It is the sound of a couple of score of broad, stiff fans, flapping to and fro with great rapidity. Look, I drop this piece of light thistle-down near the door of the hive, and you see it is at once blown away from it by a steady draught. If you could see through the straw walls,



you would discern twenty little sturdy fellows holding on to the floor of the hive with their feet, just within the door, and flapping their wings backwards and forwards without a moment's pause. Now and then one or two tired insects drop out from the line of the fanners, but their places are immediately filled by fresh recruits, who lay hold of the floor and fall vigorously to work with their wings. This is the appointed band of air-purifiers, plying their business for the good of the entire community, and wafting a fresh breeze continuously through the hive. The bees take it by turns to carry on this necessary labour, and some of them are always at it. The humming caused by the rapid vibrations of their fans, scarcely ever ceases. It has been ascertained that air taken from the inside of a crowded hive, is quite as pure as the fresh air that floats in the open space around; so perfectly do these little earnest workmen accomplish their purifying task

The industrious bees, then, are an example to mankind. IF PEOPLE DWELL IN CLOSE ROOMS, THEY MUST CAUSE AN ARTIFICIAL BREEZE OF FRESH AIR TO BLOW THROUGH THEM. Having shut out the great wind, that it may not chill too much by its uncontrollable currents, they must introduce such a little wind as they can keep thoroughly under control, but which nevertheless is sufficient to perform the office of purification as far as it is required. This process of causing an artificial wind to

blow through the inside of a dwelling is called *ventilation*, from a Latin word which signifies "to blow" or fan with the wind.

In very hot climates where dwellings need to be ventilated for the sake of coolness, as well as for purification, men follow precisely the example set by the bees. They hang up broad and stiff canvass fans, which they call *punkas*, near the ceiling, and cause these to flap backwards and forwards constantly, by pulling them to and fro with ropes. In more temperate climates, it is rarely found necessary to take all this trouble, for the air readily makes currents of its own accord inside of rooms, if only allowed to do so. All that is necessary is the furnishing a free passage into the room, and a free passage out, and it will then make a clear march through. One opening will not do, when fans are not kept going, because then the entering and departing air would meet face to face and obstruct each other. THERE MUST BE "IN" AND "OUT" DOORS, just as one sees in much frequented offices and banks, in great towns.

A very effectual plan for securing the ventilation of a dwelling room—consists in carrying a pipe of perforated zinc across the house, from outside wall to outside wall, just beneath the ceiling, allowing the ends to pass through the walls quite into the open air; then whichever end of the pipe chances to be most towards the quarter of the heavens from which

the wind is blowing, should be closed with a plug, a free passage being left for the escape of the heated air through the opposite end. A number of holes should also be made through the door, near its bottom, until altogether they afford as much room to passing air as the inside bore of the zinc pipe. If you cannot manage to fix such a zinc pipe across the ceiling, why take out one or two of the panes of the window, and put into their place, plates of what is called *perforated zinc* (zinc plates pierced full of holes), such as you may buy for a trifle at any ironmongers. That is the next best thing you can do.

As soon as some arrangement of this kind has been completed, you will find that the air begins to move gently through the room, cold fresh air coming in through the holes in the door, and warm impure air being pressed out before it through the perforated zinc tubes or plates. This takes place partly because the external wind rushes, in its hasty way, against the openings through which the air is intended to enter, and forces itself in; but also, and more particularly, because the inside air gets warmer than the outside, and is then compelled to shift its quarters on that account.

The air contained inside of inhabited rooms gets warmed by the bodies and breaths of the persons living there. THEN IT IS LIGHTER, BULK FOR BULK, THAN THE COLDER AIR OUTSIDE, for warmth stretches and lightens every thing. But as heavy things fall or

press down to the earth more strongly than light ones, THE COLD AIR ALWAYS SQUEEZES INTO THE ROOM THROUGH THE LOWER OPENINGS, and pushes the warm impure air out before it, through the upper ones.

When you light a fire in your room during cold weather, it makes a quick and strong draught through the room, for the same reason. Fires, indeed, are among the most powerful ventilators that can be brought into play. Let your fire out, and go on sitting in the room with two or three of your neighbours, and you will find the air of the room will be close and foul in half-an-hour, although it was quite fresh before. While the fire is burning, the chimney takes upon itself the office of the holes in the zinc tube or zinc plate fixed in the window, and the heated air of the room is pushed up through it by the fresh cold air which rushes in through all other openings and crevices. It is only in rooms where no fires are burning—as for instance, in your sleeping room—that holes through the walls and windows can serve as *outlets* for impure air.

But if you live with several companions, in small rooms, as some workpeople are compelled to do by their occupation, those rooms cannot get properly ventilated, even although fires are burning. Some of the poison-vapours, poured out from your living bodies with the breath, are so light that they are at once driven up to the top of the room, and collect

there gradually, spreading lower and lower as they become more abundant. They cannot get out through holes made in the walls or windows, because, as we have seen, the fire causes streams of cold air to press in there.

Dr. Arnott has, however, contrived a plan to ensure perfect ventilation even in small and crowded rooms, provided fires be burning.—This plan consists in making an opening into the inside of the chimney, near to the ceiling, and fixing a balanced valve in it in such a way that the valve-plate is opened by outward draughts, but immediately closed by inward ones. Then the impure vapours lurking near the ceiling, are continually being swept away, into the current of the chimney, through this valve.\*

\* A very perfect circular ventilating valve is sold by Messrs. Bailey, 272, Holborn, ready to be fixed to the chimney-shaft, for 7s. 6d. It should be understood, however, that in order that this valve may work correctly, it is necessary for the throat of the chimney, just over the fire place, to be contracted. If there be a *very large* draught into the chimney over and through the fire, there will be a tendency to a downward current through the valve, to help to supply the inordinate demand below. When the ventilating valves fail, and smoke falls back from the chimney through them, it is commonly because this has not been attended to. The entrance to the chimney-shaft should be narrowed over the fire, until a square hole, only about four or five inches wide, is left for the passage of the smoke and hot air; and then a low arch should be fixed, as a sort of blower, over the top bar of the grate, to quicken and steady the draught. When this arrangement has been properly made, it will be found that the fresh air which enters the room, escapes by two streams into the chimney, a part passing over the fire, and another part flowing steadily and continuously through the valve.

You are sure you have no money to spare to buy valves, and zinc tubes and plates, or to pay to workmen for making holes in your walls, and in your doors and windows. I admit that properly these trifling things should be done at the expense of the landlord to whom the house belongs. It should be as much his duty to make a house fit to live in, so far as due ventilation is concerned, as it is to keep it dry by covering it with a roof of tiles or slate. As landlords, however, are commonly themselves ignorant about these matters, you must learn to look to the affair for yourself. You will be the sufferer if the right thing be not done, therefore it is alike your interest and your duty to see that it is done.

Suppose then that you have a hard landlord who will do nothing for you, and that you are so poor you cannot spare a shilling or two for the purchase of metal tubes or plates. Then I will tell you what I would do, if I were in your shoes. I would borrow a large gimblet of the carpenter, and I would bore a row of holes through the upper part of the window frame in my bed-room, just above the glass, sloping them downwards a little, so that the rain may not be able to run in; next I would never quite shut the door of the chamber, and I would bore other holes through the frames of the windows down stairs, to act as channels of inlet. A few rough pegs of wood would serve to close some of the holes, if at any time too much air entered the room in consequence of a



strong wind blowing outside. This is what I would do, rather than I would submit to be *poisoned* at night, because I was poor.

A single round hole, a little more than half an inch across, would allow as much air to pass through it, as would be sufficient to supply the breathing of one person, provided the air were driven along by the movements of a fan, or by other mechanical contrivance, with the force of a very gentle breeze. Generally, however, it does not move so fast as this through rooms, when only caused to do so by the greater pressure of external colder air. It is, therefore, better that the ventilating openings, both for inlet and departure, should altogether make up much more than a hole half an inch across.

IT IS NOT POSSIBLE TO HAVE TOO MUCH FRESH AIR IN A ROOM, provided only an uncomfortable and chilling draught is not allowed to blow upon the body of the inhabitant. You may easily prevent any discomfort or mischief from draught, even where a great abundance of air is admitted, by hanging a curtain to catch it and turn it aside. You will find, however, that there is very little chance of any troublesome draught when no fire is burning in the room, to make the air rush in with increased power, for it is fires, as you will remember, which cause quick and strong currents.

THE WARMER AND STILLER THE EXTERNAL AIR IS, THE MORE DIFFICULT IT BECOMES TO SECURE FREE



VENTILATION THROUGH THE INSIDE OF ROOMS. In the calm hot nights of summer, the windows of sleeping rooms should on this account be left partly open all night long. It is better to breathe air moistened with night dew than it is to breathe air laden with poison-vapours.

But if it be important when people are well that they shall have an abundance of fresh air moving through their dwellings, it is of FAR GREATER CONSEQUENCE THAT THERE SHALL BE A THOROUGH VENTILATION KEPT UP IN ROOMS WHERE THERE IS SICKNESS. In all kinds of fevers the blood is overloaded with poison-vapours, and these cannot get out of the body unless they are blown away by pure air. The sick person cannot be freed from the poison-vapours that are clogging up his vital organs until fresh air is supplied abundantly. Do you remember what it was that first made you better, when you had the fever last year? Can you not recal to mind how all the doors and windows of your room were kept constantly open, and how angry I was whenever I came to your chamber and found them fast closed! Have you forgotten how delicious the fresh air felt to your parched and poisoned frame, and what luxury there was in the clean linen when supplied to your body and to the bed, and in the cold water when it was sponged over your skin?

If ever you are called upon to attend a neighbour or a relation who has to suffer from infectious fever, as

you then did, be sure you furnish to that sick person the same comfort and alleviation which were provided for yourself. Let this be your

**Plan for Nursing the Sick,**—Open wide the doors and windows of the chamber. Keep the body of the patient and the room very clean. Change the linen both of the person and the bed very often. Allow only the very simplest kinds of food and drink to be given, and that in small quantities at a time. Prevent all noise and confusion around the bed. There are very few persons indeed who will not recover speedily from attacks of even the worst kinds of fever, if this simple and prudent plan of treatment is steadily pursued.

The poison-vapours of fever and other infectious diseases are very deadly when in their greatest strength, but remain so for a very short time when left to the influences and operations of nature. They cannot bear the presence of fresh air. If they are mixed with a great abundance of it as they come out of the mouths of sick people, they directly cease to be dangerous poisons. **ALL THAT IS NECESSARY TO PREVENT INFECTIOUS FEVERS FROM BEING COMMUNICATED FROM PERSON TO PERSON, BY MEANS OF THE BREATH, IS TO TAKE CARE THAT FRESH AIR IS CONTINUALLY PASSING THROUGH THE SICK ROOM.** Attendants and visitors may remain with perfect safety in rooms where even the worst kinds of fever are prevailing, if they keep all the doors and

windows of the chamber open, and are careful not to catch the breath of the patients until it has passed through some two yards of space, where there is perfectly pure air.

Such then is the "WORTH OF FRESH AIR." It keeps the body healthy and strong. It blows away and destroys the invisible and dangerous poisons which are steamed forth from putrid and decaying matters, and which are to the delicate organs of the living frame, much worse than dust and dirt are to clock-work. In disease it is nature's chief remedy;—the best medicine of the best Physician, furnished gratis, because He is full of bounty, as well as of great skill. Never let it any longer be a reproach to you, that you ungraciously turn away such a precious gift and priceless boon from your doors. Rather fling wide your windows, as well as your doors, and welcome it to your heart. GO TO THE BEE, CONSIDER ITS WAYS, AND BE WISE!





